

# ScienceNews

INDEPENDENT JOURNALISM SINCE 1921

NEWS

HEALTH &amp; MEDICINE

## Here's what you need to know about the COVID-19 vaccines

One big unknown: Can these early vaccines stop the spread of the coronavirus?



On December 2, the United Kingdom became the first country to authorize a COVID-19 vaccine made by pharmaceutical giant Pfizer (the company's New York City headquarters, shown) and its partner BioNTech of Germany.

ANTHONY BEHAR/SIPA VIA AP IMAGES

By **Tina Hesman Saey** and **Jonathan Lambert**

DECEMBER 8, 2020 AT 6:00 AM

UPDATED DECEMBER 22, 2020 AT 10:30 AM

The U.S. Food and Drug Administration has now given emergency use authorization to both the Pfizer-BioNTech and Moderna COVID-19 vaccines, and people around the country are beginning to be vaccinated. But there are still crucial questions about how these vaccines and others will work once they get injected into people around the world.

Here are answers to some commonly asked questions.

## Can you still get infected, and infect others, if you get vaccinated?

Possibly. None of the vaccines tested so far have been 100 percent effective so some vaccinated people may still catch the coronavirus.

What's more, neither the Pfizer nor the Moderna vaccine trials tested whether the vaccines prevent people from being infected with the virus. Those trials, instead, focused on whether people were shielded from developing disease symptoms. That means that it's not clear whether vaccinated people could still develop asymptomatic infections — and thus still be able to spread the virus to others.

In both trials, some people who got the vaccine did get sick with COVID-19, but not as sick as those who got placebos. One vaccine recipient became severely ill in the [Pfizer study](#) compared with nine in the placebo group (SN: 11/18/20). No one who got the [Moderna vaccine](#) became severely ill, while 30 people who got the placebo developed severe disease (SN: 11/30/20).

---

**[Sign up for e-mail updates on the latest coronavirus news and research](#)**

---

In a separate trial, AstraZeneca and the University of Oxford have reported that they found [fewer asymptomatic cases](#) among people who had gotten their vaccine than in a comparison group (SN: 11/23/20). That might suggest some protection against infection as well as illness.

In general, some vaccines are more effective at reducing severity of disease than reducing transmission. While these early COVID-19 vaccines will probably all have some effect on transmission, it remains to be seen how much or if one vaccine is better at reducing the spread of the virus than another.

It is important to remember that you can't get COVID-19 directly from the vaccines being evaluated now as none of them contain the complete virus.

## So how are these vaccines useful?

These vaccines seem to reduce the likelihood a person will develop symptoms if they are infected as well as the severity of illness. That could be an enormous help in keeping people out of hospitals, preventing deaths and perhaps reducing some of the long-term side effects of

COVID-19. Those include heart and lung problems that some people develop after a bout of the disease.

It's true that an ideal vaccine would greatly lower the risk of transmission. But not all do. Influenza vaccines, for example, may not protect against all infections, particularly when those shots don't perfectly match the virus strains circulating each year. Other times, the shots lessen the chance of infection, but don't completely eliminate it because influenza viruses mutate quickly and can slip by immune defenses erected by even well-matched vaccines. But even imperfect vaccines can make flu illnesses [less severe](#).

## **Will people still need to still wear a mask and socially distance after being vaccinated?**

Yes. It takes several weeks to build up vaccine-induced antibodies and other immune defenses, and both vaccines from Pfizer and Moderna require a booster dose 21 to 28 days after the first dose. So the full protection offered by the vaccines would take at least a month to develop.

And since the vaccines don't work perfectly, and it's not known yet to what extent they prevent infection, it's possible that a vaccinated person might get the virus and be able to pass it on to others.

Although the vaccines may help in controlling the pandemic, "people have to understand that this is not a magic wand," Peggy Hamburg, a former commissioner of the FDA said December 3 during [a news conference](#) hosted by SciLine, an independent, free service for journalists based at the American Association for the Advancement of Science. It "doesn't mean that suddenly we can abandon all the other activities that have been so important to reducing rates of infection."

In other words, people will still need to wear masks, socially distance, wash their hands and avoid large gatherings, especially indoors. Plus, it will take time to vaccinate everyone. Until that happens and until it's clear how well the vaccines prevent transmission, other safety measures will still be needed, Hamburg stressed.

## **Are these vaccines safe?**

So far, they appear to be safe. Most vaccine side effects happen within the first weeks to months after getting a vaccine, which is why the FDA required companies to have two months of safety data before applying for emergency use authorization.

Data collected in clinical trials indicate that [side effects of the vaccines](#) include fever, headache, arm soreness, redness at the injection site and a feeling of being rundown. Such side effects are common for vaccines approved for other diseases.

"Those are things we expect, and we've been very reassured that we haven't seen cases of things we would not expect," said C. Buddy Creech, director of the Vaccine Research Program at Vanderbilt University in Nashville. Creech, who is involved in the Phase III clinical trials testing safety and efficacy of the Moderna vaccine as well as Johnson & Johnson's, spoke December 3 during a news conference sponsored by the Infectious Diseases Society of America.

Even after the vaccines are rolled out to the public, government regulators, health care organizations and manufacturers will continue to collect safety data.

In the United Kingdom, two health care workers had allergic reactions after receiving Pfizer's vaccine since that country's rollout began. Health officials in the United Kingdom have now recommended that people who have a history of "significant" allergic reactions not take the vaccine.

Ross McKinney Jr., chief science officer of the Association of American Medical Colleges, based in Washington D.C., says he considers that decision "a serious overcall." The reactions may be a result of latex in the vaccine vial stopper or the Band-Aid stuck on people's arms after the shot, he says, rather than to the vaccine itself.

The *Washington Post* reported that [both health care workers are "recovering well"](#) and that health officials in the United Kingdom had noted that "nurses and pharmacists who give vaccines are prepared to deal with allergic reactions and that such reactions are rare."

## **When might groups such as kids or pregnant women be vaccinated?**

None of the vaccines have been tested yet in kids under 12 or in pregnant women, so both groups are likely going to be near the back of the vaccination line.

Women of childbearing age in particular make up a large proportion of health care workers and frontline workers, "so we really don't have a vaccine for everyone until we have a vaccine for pregnant women," said Kathleen Neuzil of the University of Maryland School of Medicine in Baltimore during the Infectious Diseases Society news conference on December 3.

Researchers have been waiting to get data from animal studies on how the vaccines might affect reproduction and development before testing in pregnant people. Some companies now are close to the end of such studies, and may begin testing the vaccines in pregnant women soon, said Neuzil, who is director of the Center for Vaccine Development and Global Health at the medical school.

---

### See all our coverage of the coronavirus outbreak

---

For children, researchers were mostly waiting to find out how effective the vaccines are. Now that at least the first vaccines are reporting high effectiveness at preventing symptoms, the benefit of getting the vaccine probably outweighs any risks, making companies more comfortable testing in children.

Pfizer has been testing its vaccine in adolescents 12 and older, and Moderna plans to do so soon. This is typical of the process of vaccine testing, which starts with healthy adults and works down to adolescents, and then to younger children, William Moss of the Johns Hopkins Bloomberg School of Public Health in Baltimore said December 3 during [a Johns Hopkins news conference](#).

Moss, who is executive director of the International Vaccine Access Center at Johns Hopkins, said he is hopeful that by the fall school term in 2021 there will be a vaccine for children 12 and older. By then, "I think we have a good shot of having a vaccine for even younger children as well," he says.

### Can these vaccines help us achieve herd immunity?

Scientists are still working out how many people must have immunity to the virus to starve outbreaks of susceptible hosts and bring the pandemic to an end. Most estimates fall [between 60 to 80 percent of a population](#), though how many people will need to be vaccinated to reach this point is still unclear and depends on vaccine efficacy.

If vaccines were maximally effective at preventing disease and transmission, vaccinating enough people to precisely hit the herd immunity threshold would be sufficient. But less effective vaccines require more people to be vaccinated, to account for potential gaps in immunity.



And like we've noted above, it's still unclear how vaccines such as those from Pfizer and Moderna affect transmission. If these vaccines don't prevent transmission at all, achieving herd immunity via vaccination becomes impossible. But such a scenario is very unlikely: By lowering disease severity, the vaccines could likely decrease transmission by reducing the number of days a person sheds infectious virus, for instance. For now, scientists await more data.

Even if the vaccines do end up reducing transmission effectively, reaching herd immunity globally will require equitable distribution of vaccines, which will be challenging given the [logistical requirements of the current slate of vaccines](#) (SN: 12/3/20). If people living in poorer, more rural areas cannot access the vaccines, outbreaks could persist in these regions and prevent an ultimate end to the pandemic if the problem were widespread.

## I've had COVID-19. Should I get vaccinated?

The short answer is yes, eventually.

The U.S. Centers for Disease Control and Prevention currently says that people may be advised to get a COVID-19 vaccine [even if they've been sick with the virus before](#), in part because people's immune responses can be variable after natural infection. The agency is waiting for more data to make specific recommendations on timing.

Scientists still don't have a full understanding of how long someone is immune after being infected with the coronavirus. Some research suggests immunity lasts for [more than six months](#) (SN: 11/24/20). Other research suggests that [antibodies can wane after a few months](#), especially in those with milder illness (SN: 10/19/20).

Given this variability, a vaccine may provide a surer immune response than natural infection. Preliminary data have shown that individuals who [received the Moderna vaccine in a clinical trial had more antibodies than a natural infection usually produces](#).

Still, most research suggests that the vast majority of people who contract the coronavirus have some level of protection for at least a couple months. Given that, these people likely won't be at the front of the line for getting a scarce vaccine anytime soon.

## Who will be vaccinated first?

Right now, there's a limited supply of vaccines available in the United States. Federal officials have said there will be enough to vaccinate 20 million people by the end of December. Each state is responsible for figuring out who gets the vaccines first within its borders.

Since demand will exceed supply, the CDC has released guidelines on [which groups should be prioritized](#). First in line are the approximately 21 million frontline health care workers in the country, and the roughly 3 million adults living and working in long-term care facilities. Next are adults over 75 and frontline essential workers, including first responders, grocery store workers and teachers. The third tier includes 65- to 74-year-olds, people over 16 with high-risk medical conditions, and other workers deemed essential, though it will be up to individual states to decide who falls into those second two categories.

Anthony Fauci, director of the National Institute of Allergy and Infectious Diseases, has said that vaccines might be available to anyone who wants one by April 2021, if production and distribution goes smoothly. The CDC expects that by the end of 2021 there will be enough vaccines to vaccinate all U.S. adults.

## Will the vaccines work on new strains of the virus?

The short answer is yes: The current crop of vaccines will likely be effective for at least a few years, researchers say.

Over time, all viruses naturally evolve. Their genetic sequences can change by random chance, or by natural selection. One powerful source of selection is our immune system. New genetic changes that eventually allow viruses to evade our ability to detect and destroy them can spread rapidly through a viral population, raising the possibility that the virus might evolve in ways that render vaccines less effective.

The emergence of a new, potentially faster spreading strain of the coronavirus in the United Kingdom has raised this fear anew. But experts say that the Pfizer-BioNTech and Moderna vaccines will likely remain effective against small changes in the coronavirus for a few years.

"There's not one magical mutation that's all of a sudden going to make vaccines ineffective," says Stephen Goldstein, an evolutionary virologist at the University of Utah in Salt Lake City. "Our immune response is so diverse," he says. That diversity means that a virus likely needs to accumulate many, many changes before it becomes invisible to our immune systems.

Still, those changes will likely accumulate. Another [coronavirus that causes the common cold evolved changes over at least eight years](#) that finally allowed it to evade detection by the immune system, researchers reported December 18 on bioRxiv.org. But scientists can keep tabs on these types of changes, and even tweak vaccines to accommodate viral evolution.

---

**Editor's Note:** This story was updated December 9, 2020, to include new information on allergic reactions in the United Kingdom to Pfizer's vaccine, and on December 22, 2020, to include additional questions and answers.

---